Introduction

Welcome to FIRST® LEGO® League Explore!

In FIRST® LEGO® League Explore, teams focus on the fundamentals of engineering as they explore real-world problems, learn to design and code, and create unique solutions made with LEGO® bricks and powered by LEGO® Education SPIKE™ Essential. FIRST LEGO League Explore is one of three divisions by age group of the FIRST LEGO League program. This program inspires young people to experiment and grow their confidence, critical thinking, and design skills through hands-on learning. FIRST LEGO League was created through an alliance between FIRST® and LEGO® Education.

FIRST® DIVE™ presented by Qualcomm and SUBMERGED™

Welcome to the FIRST® DIVE™ presented by Qualcomm season. This year’s FIRST LEGO League challenge is called SUBMERGED™.

This season, children will learn about how and why people explore the oceans. Our discoveries beneath the ocean surface teach us how this complex ecosystem supports a healthy future for the plants and animals that live there.

During each session, teams will experience the engineering design process. There is no set order for this process, and they may go through each step several times in a single session. This means that during a session, children will be exploring the theme and ideas, creating solutions, testing them, iterating and changing them, and then sharing what they’ve learned with others.

More than 80% of the ocean remains unexplored, offering curious minds deep opportunities to dive into expeditions.

Working in Teams

Children work together in teams of up to six members using pieces from the LEGO Education SPIKE™ Essential set and an Explore set. Teams will collaborate and communicate to build, learn, and play together.

Children should be encouraged in every session to work with their teammates, listen to each other, take turns, and share ideas and pieces.
What Does the Team Need?

**LEGO® Education Set**

**LEGO® Education SPIKE™ Essential Set**

*Note:* Other LEGO Education sets such as WeDo 2.0 are also allowed.

**SUBMERGED™ Explore Set**

Each team will get one SUBMERGED™ Explore set. Leave the LEGO® pieces in their bags until the sessions in which they are needed.

Two printed books contain the building instructions for the Explore model.

**Electronic Device**

Your team will need a compatible Bluetooth-enabled device like a laptop, tablet, or computer. Scan the QR code to view system requirements and download software.

**Team Poster Supplies**

Each team will need a large poster board and various art supplies and materials in Sessions 10-11.

<table>
<thead>
<tr>
<th></th>
<th>Submarine</th>
<th>Motor and Hub Pieces*</th>
<th>Sunline Zone Pieces</th>
<th>Twilight Zone Pieces</th>
<th>Abyssal Zone Pieces</th>
<th>Prototyping Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bag</td>
<td>1, 2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7, 8, 9, 10, 11</td>
</tr>
<tr>
<td>Book</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

*The motor and hub are part of the SPIKE Essential set. Bag 3 contains bricks needed to attach these pieces to the submarine model in the Explore set.*

**Tip**

- The prototyping pieces and baseplates are used throughout the sessions to build solutions to the design challenges.
Every session starts with an introduction and ends with a share activity. Details for these activities are given in the session pages that follow, along with notes and tips to help you run the session.

**Sessions at a Glance**

### Session 1 – Dive In!
- Explore SUBMERGED™ Theme
- Build Submarine Model
- Free Build

### Session 2 – Ocean Layers
- Build Sunlight/Twilight/Abyss Models
- Explore Ocean Layers

### Session 3 – Sunlight Zone
- Coding Lesson 1
- Explore Sunlight Zone

### Session 4 – Twilight Zone
- Coding Lesson 2
- Explore Twilight Zone

### Session 5 – Abyssal Zone
- Coding Lesson 3
- Explore Abyssal Zone

### Session 6 – Deep Sea Discovery
- Build Unknown Creature
- Build Artificial Habitat

### Session 7 – Exploration Station
- Build Exploration Station
- Explore Jobs and Technology

### Sessions 8 & 9 – Team Model
- Design Team Model
- Build Team Model

### Sessions 10 & 11 – Team Poster
- Design Team Poster
- Create Team Poster

### Session 12 – Prepare for Event
- Finish Team Model and Poster
- Practice Sharing

CELEBRATE AT A FESTIVAL!
Session 1

Outcomes
- The team will use discovery to explore the SUBMERGEDSM theme and share what they know about the oceans.
- The team will build different things found in the ocean and the submarine from the Explore set.

Guiding Questions
- What did the Explore story make you think about?
- What plants and animals live in the ocean?
- How do people explore the oceans?

Session Tips
1. Scan here to find more resources you can use with your team.
2. Look ahead at the next few sessions to see which ocean environments will be discussed and share with the team to help them generate ideas.
3. Writing and drawing space is provided throughout the notebook for each child to capture their thoughts and ideas.

Extension
- Have the team research ocean discoveries and learn about the technology that was used.
- Do an ocean-themed show-and-tell activity with the team.

Introduction (10 minutes)
Let’s Discover
- Read the definition for discovery to the team (see page 5).
- Talk about what discovery is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw themselves using discovery on the Core Values page in the Engineering Notebook.
### Core Values

Draw or write an example of your team using each Core Value when directed in the sessions.

<table>
<thead>
<tr>
<th>Core Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DISCOVERY</strong></td>
<td>We explore new skills and ideas.</td>
</tr>
<tr>
<td><strong>INCLUSION</strong></td>
<td>We respect each other and embrace our differences.</td>
</tr>
<tr>
<td><strong>INNOVATION</strong></td>
<td>We use creativity and persistence to solve problems.</td>
</tr>
<tr>
<td><strong>TEAMWORK</strong></td>
<td>We are stronger when we work together.</td>
</tr>
<tr>
<td><strong>IMPACT</strong></td>
<td>We apply what we learn to improve our world.</td>
</tr>
<tr>
<td><strong>FUN</strong></td>
<td>We enjoy and celebrate what we do!</td>
</tr>
</tbody>
</table>
Session 1

Activity 1 Tasks

☐ Read the Explore story to learn about the SUBMERGEDSM theme.

☐ Talk about what you know about the oceans with your teammates.

☐ There are many ocean mysteries left to explore. Think about what part of the oceans you and your teammates would want to explore and hope to discover.

☐ List your questions about the ocean below.

Your team needs:

What did you learn from reading the Explore story?

What animals or objects did you recognize in the Explore story?

More than 80% of the ocean has never been mapped, explored, or even seen by humans!

What animals and objects do you want to learn more about?
Dive In!

Activity 2 Tasks

☐ Build the submarine from the Explore set using Bags 1 and 2.

☐ Talk about the different parts of the submarine and what they might be used for.

☐ Think of something your submarine might discover in the ocean.

☐ Use the space below to draw your ideas.

Challenge

☐ Use the prototyping pieces to build animals, plants, or unknown object that your team wants to learn about.

☐ Share your ideas.

An autonomous underwater vehicle (AUV) is like a small submarine that doesn’t need a person to drive it. A remotely operated vehicle (ROV) requires a person to drive it, and it is connected to the ship with cables.

My ideas:

Scan me to see a video of the submarine model.
Team Journey

- Explore the challenge
- Learn about Core Values
- Create team model
- Design team poster
- Explore, create, test, and share as you go through the sessions
- Celebrate at an event

**Explore**
- Engineering Design Process
- Create

**Share**
- Test

**EXPLORE**
- Engineering
- Design
- Process

**TEST**
- Create

**SHARE**
- Test

**CREATE**
- Explore

**SAMPLE**
- Explore Team Journey
- Test Idea
- Share Results
- Create Team Model
- Design Team Poster
- Celebrate at an event

**SAMPLE**
- Explore Team Journey
- Test Idea
- Share Results
- Create Team Model
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- Celebrate at an event